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Economic Contribution and Analysis of Supply Chain of Tongan Squash Pumpkin Industry

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ABSTRACT

Agriculture is the most crucial sector in the South Pacific Island Countries and similarly in Tonga it plays a pivotal role in economic growth and development. In particular, the export of squash pumpkins from Tonga to Japan is one of the few successful stories of agricultural export from the South Pacific Island Countries. During 1990s, the squash pumpkin industry uplifted the Tongan economy from negative growth to a 5.4% growth in 1999 (Asian Development Bank, 2005, as cited in Kautoke-Holani, 2008). This demonstrates the greater economic importance of squash pumpkin industry in Tonga. The squash pumpkin industry further contributes to the Tongan economy via its backward and forward linkages in the supply chain. Against this backdrop, this paper will examine the economic contributions of the squash pumpkin industry in Tonga. The paper will also analyse the supply chain of the Tongan squash pumpkin industry.

Keywords: Supply Chain Management, Squash Pumpkin, Employment, Export Earnings, GDP, Stakeholders, Economic Benefits, Constraints, Challenges

1. Introduction

The production of squash pumpkin began in 1987. Japan is the largest importer of Tongan squash pumpkin with approximately 12,000 tons imported each year (Felemi, 2001: 8). On average, trade statistics indicate that the squash industry alone accounts for 70% of all agricultural exports, contributes around 50% towards Tonga's total export earnings, contributes 25% to the GDP and employs approximately 38% of people employed in the agriculture sector (Tonga Department of Statistics, 2010). In this context this paper will examine five major aims related to the Tongan squash pumpkin industry. First, it will examine the economic contribution of squash pumpkin industry to Tonga's economy. Second, it will highlight the background of the squash pumpkin industry, the various stakeholders present in the industry and the institutional setup of the squash industry. Third, it will map the squash pumpkin supply chain and discuss the various node of the supply chain. Fourth, it will identify the various problems and constraints of the squash industry. Finally, it will discuss whether there is opportunity for value adding and the uncertainty of future export in the Tongan squash pumpkin industry.

2. Literature Review

To date, few scholarly articles have been published that have rigorously analysed the Tongan squash pumpkin industry by using a supply chain analysis. Only a few academic articles have discussed about the economic contribution and problems of the squash pumpkin industry. First, Felemi (2001) focused on constraints, challenges and prospects for development of the squash export industry in Tonga. This article primarily highlighted the socio-economic significance of the squash pumpkin industry. Second, Velde, Green, Vanclooster and Clothier (2007) have highlighted that squash industry of Tonga has made a major impact on the Tongan economy in terms of providing export earnings and employment opportunities. Third, Storey and Murray (2001) have looked at the uneven distribution of proceeds from the squash industry. Fourth, Fleming and Blowes (2003) looked at the long term sustainability of squash pumpkin industry

Moreover, contributing further to the existing literature there exist various non published monographs, reports and articles on squash pumpkin industry of Tonga. Crowley, Karalus, and Tasman (2003) argue that the bulk of the Tongan export earnings that is around two-thirds are derived from squash exports which are focused primarily on the Japanese markets. Kautoke-Holani (2008) mentioned that the potential for agriculture to drive the Tongan economy forward was best illustrated by the squash pumpkin industry of Tonga. Fisi'iahi (2006) examined the sustainable socio-economic development in Tonga and he stated that high dependence of people on the agricultural sector in Tonga over the last few recent years was hastened by the success of the Tonga's squash pumpkin industry. Finally, Afeaki (2009) highlighted that there was an increase in the number of Tongan farmers growing squash for export from 40 farmers in 1987 to more than 1,000 in 1981.

Finally, there are also a few magazine articles in the Islands Business and the Review Magazine on the Tongan squash pumpkin industry and these are written by Brown (1999; 2004), Keith-Reid (1998) and Chaudhari (1994). The two articles written by Brown (1999; 2004) focused on the market fluctuations in the Tongan squash pumpkin export industry. The third article by Keith-Reid (1998) highlighted the impact of disasters on Tonga's squash pumpkin industry. The final article by Chaudhari (1994) highlighted some of the problems of squash pumpkin industry.

Most of the writings above have discussed about the economic contribution of the squash pumpkin industry in Tonga but there is no analysis by using a supply chain perspective. This research will hopefully fill the existing gap by using a supply chain approach to study the economic contributions of the squash pumpkin industry in Tonga

3. Research Methods

The paper is based on first hand primary research fieldwork conducted by author in Tonga between 2008 and 2009. Three main research methods were used for this empirical study. First, face-to-face interviews were conducted with major stakeholders relating to squash pumpkin industry of Tonga. The first set of stakeholders who were interviewed included squash pumpkin farmers. The second stakeholders interviewed were the owners of the exporting companies. The third stakeholders interviewed were Tongan government officials namely from Ministry of Labour, Commerce and Industry. The second research method used was observation technique whereby field visits were made to the squash pumpkin farms. The third research method used was literature review of primary company and government documents and secondary articles written on squash pumpkin industry of Tonga.

4. Background of Squash Pumpkin Industry of Tonga

In 1987, squash pumpkin was introduced as a major cash crop. Tongan farmers became very interested in this industry because of the escalating demand of squash pumpkin from the Japanese markets (Felemi, 2001: 6). Since 2006, the squash market was further diversified to South Korea. Squash has also replaced the banana and copra from the late 1980s and established its position as a major agricultural export since early 1990s. In 1987, the squash pumpkin trade in Tonga began through the private sector initiative. Even though the inception of the squash pumpkin industry was a private sector imitative, the government of Tonga provided substantial assistance to the industry (Felemi, 2001: 6).

In the squash pumpkin industry of Tonga, the Tongan Development Bank (TDB) plays a pivotal role in providing financial assistance to the industry (Felemi, 2001: 6). The Ministry of Agriculture and Forestry (MAF) is responsible for the production research and extension support while the Ministry of Labour, Commerce and Industries (MLCI) are responsible for issuing of licenses and export market coordination (Felemi, 2001: 6).

The squash pumpkin industry of Tonga has been the major economic development driver over the last 15 years. During 1990s, the squash pumpkin industry uplifted the Tongan economy from negative growth to a 5.4% growth in 1999 (Asian Development Bank, 2005, as cited in Kautoke-Holani, 2008). During the period 1994-2000, the squash pumpkin industry contributed more than 40% on average to Tonga's total export earnings. More importantly, it contributed more than 70% of the total value of agricultural exports. (Felemi, 2001: 6)

Notably, in recent years the squash pumpkin industry is also responsible for the decline in total agricultural export earnings. There were many factors that caused the decline of the squash pumpkin industry. One of the major factors is the dependence of the Tongan squash pumpkin industry on 'narrow and variable window' in the Japanese market (Asian Development Bank, 2005, as cited in Kautoke-Holani, 2008).

5. Economic Contribution by Squash Pumpkin Industry

5.1 Main Export Earnings of Tonga

Table 1 and figure 1 show the data on main export earnings in Tonga. The main export earners are squash pumpkins, fish and vanilla beans respectively.

Table 1 and figure 1 show that squash pumpkins, fish and vanilla beans are the principal export earners of Tonga. Table 1 and figure 1 indicates that the export earnings from the squash industry significantly increased from early 1987 to 1997. In this period of 10 years, the squash industry has established its position as the leading foreign exchange earner in Tonga. However, from early 2000s to 2007 the total export earnings from the squash industry began to decline.

Table 1: Main Export Earnings in Tonga

Year	Fish		Vanilla Beans		Squash Pumpkins		Total Export Earnings
	(T$000)	% of TE	(T$000)	% of TE	(T$000)	% of TE	(T$000)
1987	1193	12.49	-	-	86	0.90	9553
1988	2295	21.74	-	-	544	5.15	10555
1989	1100	9.03	-	-	1,983	16.28	12183
1990	1278	8.35	2765	18.07	4,838	31.62	15299
1991	1397	6.51	2857	13.31	12,444	57.97	21465
1992	1411	8.11	2084	11.97	8,674	49.82	17409
1993	2160	9.83	2750	12.52	12,873	58.59	21970
1994	3160	17.81	2650	14.93	8,861	49.93	17747
1995	4342	24.09	2802	15.55	8,405	46.63	18024
1996	1857	12.34	1348	8.96	6,492	43.15	15044
1997	3245	23.59	167	1.21	6,313	45.90	13755
1998	1989	17.21	157	1.36	4,354	37.67	11558
1999	5281	26.43	907	4.54	8,946	44.77	19984
2000	4966	30.91	580	3.61	5,265	32.77	16065
2001	2517	17.51	617	4.29	7063	49.13	14376
2002	11307	37.15	2666	8.76	11986	39.39	30432
2003	9439	27.34	6130	17.76	13793	39.95	34522
2004	5754	18.83	913	2.99	9,237	30.23	30556
2005	4024	20.37	335	1.70	8,318	42.10	19759
2006	7009	36.85	1	0.01	5,566	29.27	19018
2007	4330	27.46	262	1.66	2,659	16.86	15769
2008	NA	NA	NA	NA	NA	NA	17514
2009	NA	NA	NA	NA	NA	NA	NA
2010	NA	NA	NA	NA	NA	NA	NA

Source: Created by authors (2010) with data provided by Asian Development Bank.

Table 2 and figure 2 shows the percentage of principal export earnings of Tonga. During the periods 1991 to 1997, the squash industry contributed to more than 40% of the total export earnings. However, from 1999 to 2005 the squash industry contributed on an average of 39.8% to the total export earnings of Tonga. Further, the squash industry has been rapidly declining from 2006.

5.2 Employment Creation by the Squash Pumpkin Industry of Tonga

Large commercial squash growers of Tonga usually employ male workers during the squash planting and growing seasons (Fisi'iahi, 2006: 189). The planting and growing seasons are for three month period. During the harvest season the squash farmers and exporting companies employ more workers including females to prepare the harvest for exporting (Fisi'iahi, 2006: 189). Majority of the squash farmers and the exporters usually pay their part time workers at a daily wage rate between the ranges of TOP$10 to $TOP20 per day and the senior permanent employees are paid ranging from TOP$2.50 to TOP$5.50 per hour (Fisi'iahi, 2006: 189). Similar salary and wage rates are paid to employees of exporting companies namely; Ha'amo Growers, Squash Export Limited, Friendly Islands Marketing Cooperative (FIMCO) Export and Touliki Export Limited (Fisi'iahi, 2006: 189).

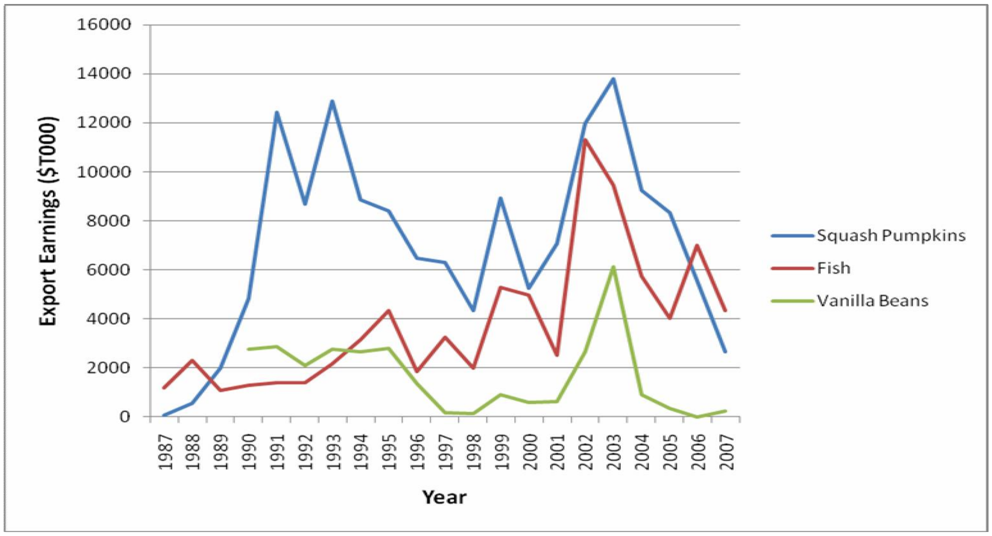

Figure 1: Export Earnings (T$000) of Tonga

Source: Created by authors (2010) with data provided by Asian Development Bank.

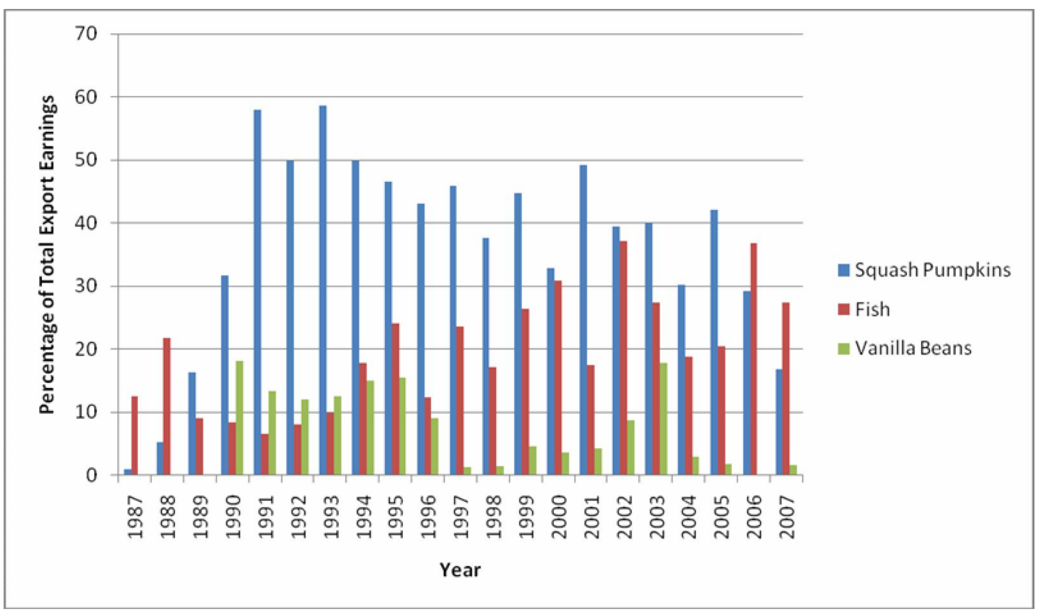

Figure 2: Principal Export Earnings as (%) of Total Export Earnings

Source: Created by author, (2010) with data provided by Asian Development Bank.

Table 2: Principal Export Earnings as % of Total Export Earnings

Year	Fish (% of Total Export Earnings)	Vanilla (% of Total Export Earnings)	Squash (% of Total Export Earnings)
1987	12.49	NA	0.90
1988	21.74	NA	5.15
1989	9.03	NA	16.28
1990	8.35	18.07	31.62
1991	6.51	13.31	57.97
1992	8.11	11.97	49.82
1993	9.83	12.52	58.59
1994	17.81	14.93	49.93
1995	24.09	15.55	46.63
1996	12.34	8.96	43.15
1997	23.59	1.21	45.90
1998	17.21	1.36	37.67
1999	26.43	4.54	44.77
2000	30.91	3.61	32.77
2001	17.51	4.29	49.13
2002	37.15	8.76	39.39
2003	27.34	17.76	39.95
2004	18.83	2.99	30.23
2005	20.37	1.70	42.10
2006	36.85	0.01	29.27
2007	27.46	1.66	16.86
2008	NA	NA	NA
2009	NA	NA	NA
2010	NA	NA	NA

Source: Created by authors (2010) by using Asian Development Bank data.

6. Major Stakeholders and Institutional Setup of the Tongan Squash Pumpkin Export Industry

The major stakeholders in the Tongan squash industry are the farmers, exporting companies, MLCI, MAF and TBD. Figure 3 shows the major stakeholders and institutional setup of the Tongan squash pumpkin export industry.

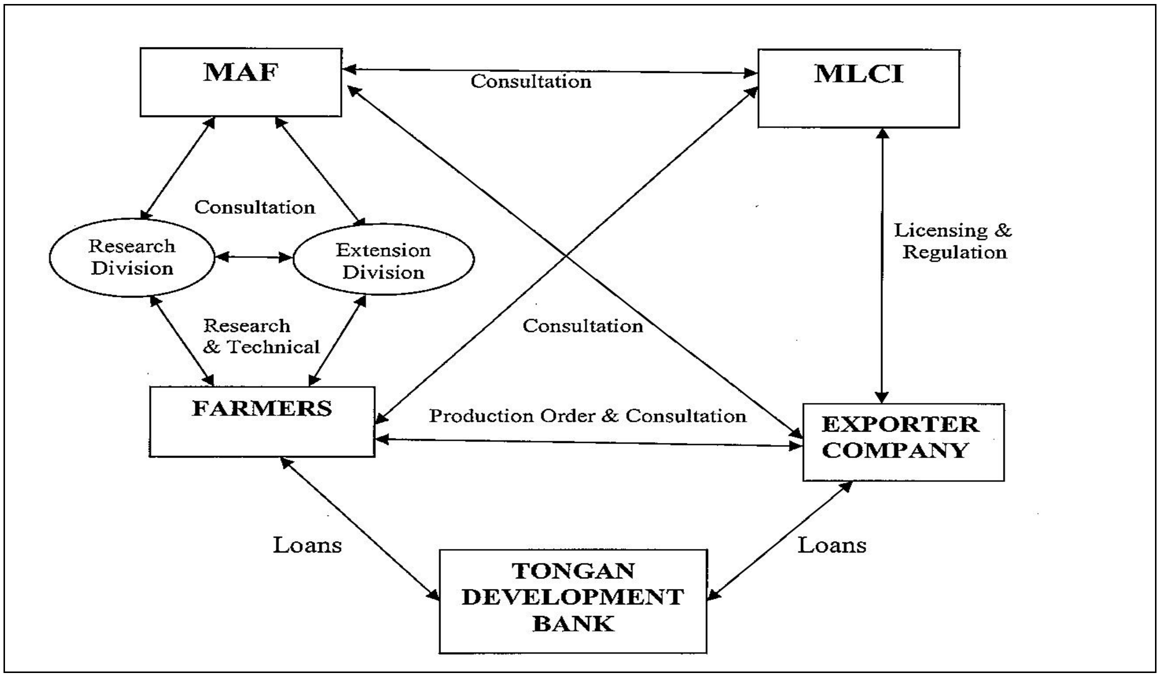

Figure 3: Institutional Set-up of the Tongan Squash Pumpkin Export Industry

Source: Created by Authors, (2010).

6.1 Squash Farmers

Tongan squash farmers are the key stakeholders who provide inputs (squash pumpkins) to be exported to Japan. During the early years of the inception of the squash pumpkin industry, more than 2,000 squash farmers were recorded (Felemi, 2001: 6). Notably, there has been a significant decline in the number of squash farmers over the past years. In 1998, statistics indicate that there were a total of 1,061 growers in the squash industry and the figure declined to 780 farmers in 1999 (Felemi, 2001: 6). This indicates a decline of 26.5%. The Ministry of Agriculture and Forestry provide research, training and advice to squash farmers and the Ministry of Labour, Commerce and Industries undertake market research and export market coordination for the farmers (Felemi, 2001: 6).

6.2 Exporting Companies

Export companies supply farmers with seeds, fertiliser, chemical, machinery and provision of credit finance. The squash pumpkin industry of Tonga began with two export companies. During 1994-1996 the number of export companies increased to thirteen (Felemi, 2001: 9). The increase in the number of export companies was followed by tighter regulation of the squash market. Tighter regulation of the squash export market in terms of issuance of export license provided a major barrier to entry for export companies in the squash export market (Felemi, 2001: 9). This contributed to a decline in the number of export companies dominating the squash export market (Felemi, 2001: 9).

In 2000, there were a total of ten licensed local exporting companies (Felemi, 2001: 10). Table 3 shows the quantity of squash exporting companies in Tonga. The table shows that six New Zealand-based companies have been engaged in exporting squash from Tonga.

The exporting companies made it mandatory for farmers to be registered with them in order to know whom they will buy the produce from and also to have an accurate estimate of the volume of squash it would export in order to facilitate negotiations with Japanese importing companies. Some exporting companies even require the farmers to sign an agreement stating that all his/her exportable squash produce will be sold to the specified company (Felemi, 2001: 14).

Table 3: Total Volume of Squash Pumpkin Exported by Companies in 2000

Exporter	Base Country	Volume Exported (MT)
Bearsley Produce Ltd	New Zealand	481.5
Friendly Islands Marketing Cooperative	Tonga	292.0
Ha'amo Growers Co. Ltd	Tonga	1,209.0
INDEX Limited	Tonga	212.0
International Produce Limited	New Zealand	1,648.0
Kaimata NZ Limited	New Zealand	58.0
Millennium Foods Group	New Zealand	3,765.0
Molisi Tonga Ltd	Tonga	821.0
Nishi Trading	Tonga	666.0
Squash Export Co. Ltd.	Tonga	1,558.0
Sunrise Coast NZ Ltd	New Zealand	67.0
Touliki Trading Ent. Ltd	Tonga	1,235.0
Tropical Exports-Imports Ltd	Tonga	154.5
Turners and Growers Int. Exports	New Zealand	2,533.0
TOTAL		14,700.0

Source: Ministry of Agriculture and Forestry Quarantine and Quality Management Division Report, (2000).

6.3 Government Institutions in the Tongan Squash Pumpkin Industry

The three major government institutions directly involved in the Tongan squash pumpkin production and export are the Ministry of Labour, Commerce and Industries (MLCI), the Ministry of Agriculture and Forestry (MAF) and the Tonga Development Bank (TDB).

6.3.1 Role of the Ministry of Labour, Commerce and Industries (MLCI)

The functions of MLCI are twofold. First, it issues the 'export license' to squash exporting companies. This is a requirement before any exporting companies can be involved in exporting squash overseas (Felemi, 2001: 14). Every year in December, the MLCI issues the criteria for the assessment of applications. After companies have lodged their application, the screening process and decision is made by January to allow adequate time for export companies to liaise with farmers for production and export for that year (Interview with CEO of MLCI and Exporters, July 2009). In this way the government is able to regulate and ensure adequate production of squash takes place to fill the Japanese market demand.

Furthermore, in 1999, a Memorandum of Understanding (MoU) between MLCI and exporting companies was signed in order to encourage a closer working relationship between the major stakeholders of the squash industry (Felemi, 2001: 10). The MLCI has also encouraged and facilitated regular consultative meetings amongst the stakeholders present in the squash industry. The deliberations and suggestions from these meetings have fed into policy making. Hence, policy making in the squash industry is very much participatory in nature (Felemi, 2001: 10).

6.3.2 Role of Ministry of Agriculture and Forestry (MAF)

The functions MAF are threefold. First, it conducts research programmes on the production of squash so that farmers can improve the quality of squash production. The officials of MAF conduct research on soil, fertilizer application rate, pest and disease control to be able to give technical advice to farmers. Second, through its Extension Division, agriculture officers disseminate information about production techniques to squash farmers (Felemi, 2001: 12). The MAF has played a key role in research, training and advice to farmers. Furthermore, most exporting companies are also involved in production research and training. Hence, there has been upgrading of farming skills as farmers over the last twenty years have acquired extensive knowledge and experience in squash farming. This was possible also because more educated people have joined the squash farming over the last two decades (Felemi, 2001: 12). Third, the MAF is also responsible for grading and quality control of all squash to be exported. All packing shed of squash must be registered with the Quarantine Service of MAF and for packing shed to be registered, it must fulfil certain requirements of MAF (Felemi, 2001: 12).

There are two grades of squash exported to Japan. Grade A is roughly between 1.2 and 2.7 kg. Grade B is referred to as 'baby squash' (Felemi, 2001: 11). 'Baby Squash' consist of only 5% of total volume of squash exported. Around 20% of total annual squash production is consumed domestically because they are not of export quality (Felemi, 2001: 11).

6.3.3 Tonga Development Bank (TDB)

The role of TDB is to give loans to farmers and export companies. Most exporting companies require financial assistance for its export marketing operations. Financing has mainly been provided by the Tonga Development Bank. However, with the more stringent lending policy of the bank some exporting companies have taken up partnership agreement with overseas companies, mainly from New Zealand, who have agreed to provide the required financial support and, in return, for the overseas companies to become the agent for their squash exports. Table 4 shows finance sources for squash growers and Tonga Development Bank loan approval (T$ million 1990-1998).

Table 4: Finance Sources for Squash Growers and Tonga Development Bank Loan Approval (T$ million 1990-1998)

	1990	1991	1992	1993	1994	1995	1996	1997	1998
TDB borrowers	378	1021	867	1255	1425	833	727	331	599
Self financed[1]	14	714	212	N/A	10	81	N/A	69	1
TDB Loan Approvals	3.81	4.5	3.0	6.0	8.0	5.8	3.6	2.2	3.9

Source: Tonga Development Bank Annual Reports, (1990-1998).

Table 4 shows that in 1990 the TDB approved T$3.81 million which sharpely increased to T$8.0 in 1994. The loan approval sharply declined from T$8.0 to T$3.9 million in 1998.

The squash pumpkin is an example of a 'buyer driven change' whereby two groups of stakeholders has control over the supply chain. First, the buyers in Japan are the key stakeholders whereby they control the chain from the Japanese end and they determine when, how much and at what price the squash pumpkin is imported from Tonga. According to Gereffi (1994), it is usually the buyers and the retailers of the developed countries who have power over the supply chain. They can source commodities from any part of the world and they can get the cheapest supplier by playing one off against the other. Most of the exporting companies are 'price takers' and not 'price makers'. Currently, there is little known about the specific details of the relationship between squash buyers in Japan and the squash export companies in Tonga.

Second, at the domestic level in Tonga, the main player in the squash pumpkin supply chain is the squash pumpkin exporting companies. This is because they control most of all the internal nodes of the production and supply chain starting from arranging bank loans for farmers, giving orders to farmers, selling farm inputs, controlling post-harvest process and exporting the produce to Japan. With regards to farm inputs, export companies sell farm inputs on credit to farmers and in most instances they tend put high profit margins on these inputs. According to the Ministry of Agriculture and Forestry the return to one Tongan dollar spent on squash farming is only $0.86 *vis-à-vis* T$2.08 for potato and T$3.57 for taro (Felemi 2001:13). Since the export companies control the governance structure of the squash chain they are the ones who make the most profit.

7.0 Analysis of the Tongan Squash Pumpkin Supply Chain

Figure 4 shows the supply chain of the Tongan squash pumpkin export industry, the Tongan squash pumpkin supply chain reveals the following features. First, the Tongan squash pumpkin supply chain is typical of most agricultural supply chain whereby it is relatively a simple commodity chain with only three countries are involved in the chain and the production and marketing system is not globally dispersed.

[1] Includes growers who financed their own operation and those financed by their exporters.

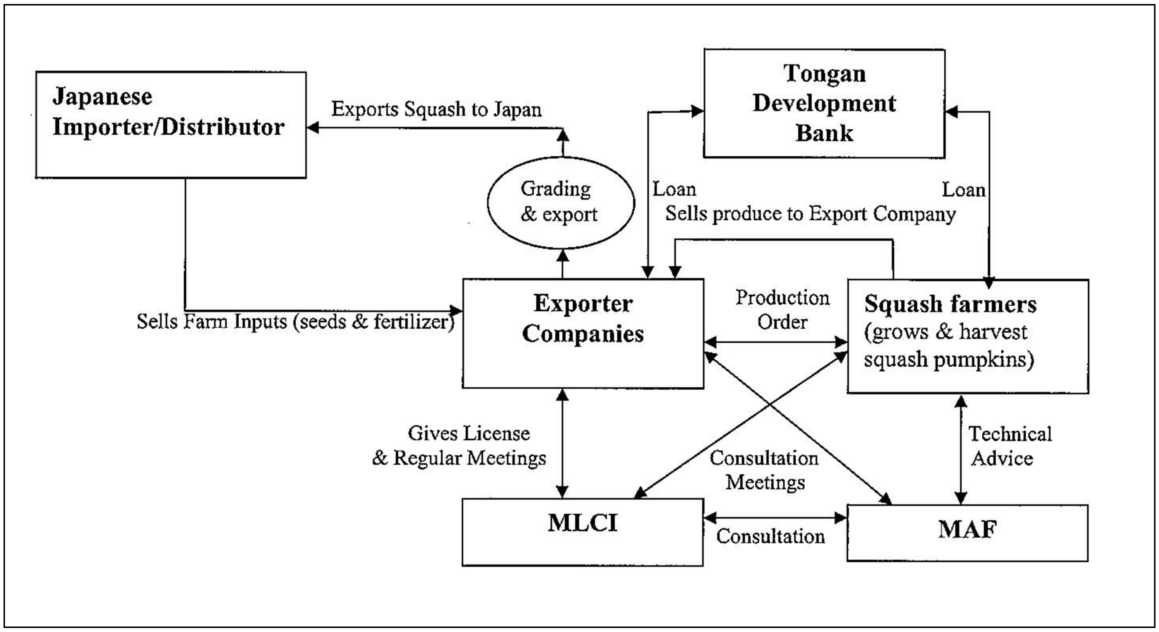

Figure 4: Supply Chain of Tongan Squash Pumpkin Industry

Source: Created by Authors, (2010)

Second, 'time' as important factor in the Tongan squash pumpkin supply chain because squash pumpkin needs to arrive in Japan by late November Hence, it should not be exported before third week November of after December when the supply of squash in the Japanese market declines. Time of delivery is crucial for Japanese buyers, distributors and retailers and this requires an efficient organisation and co-ordination (governance structure) between exporters and farmers in Tonga. It is not only imperative that a commodity is *produced Just In Time (JIT),* but also to reach the retailers on the required week as demanded by Japanese market.

Third, the supply chain reveals the complex social and economic linkages between the micro and macroeconomic processes in the Tongan squash pumpkin industry. Fourth, it reveals the importance of the role of family members, kinship and community as social variables shaping the production of squash and shaping the dynamics of squash commodity chain. Also social networks are present between exporters and farmers.

8. Constraints/ Problems/ Challenges

Even though the squash pumpkin industry has been in existence for more than 20 years, there still remain a number of major constraints and challenges that needs to be addressed. These constraints and challenges are as follows.

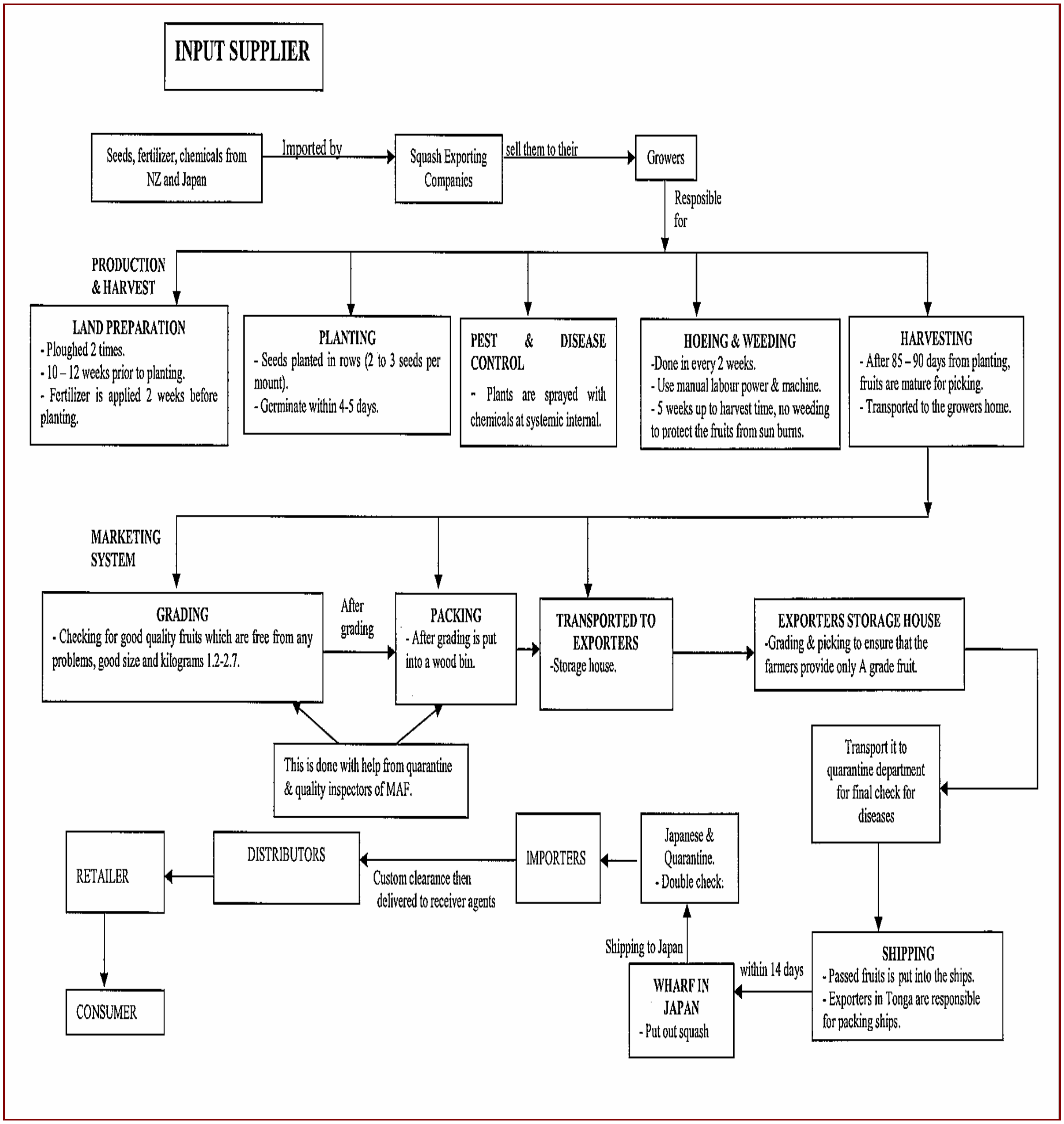

Figure 5: A More Detailed Version of the Supply Chain of Tongan Squash Pumpkin Industry
Source: Created by Authors, (2010).

8.1 Access to credit from bank

During the period 1987-2000, the approval of a loan by TDB to a squash farmer relied heavily on the recommendations of the exporting company under which the growers are registered. Previously, farmers had faced difficulty in getting loans from the TDB and if they do get it then in most cases the loan is channeled via the exporting company under which the farmer is registered. The exporting company would deduct all its cost (supplying farming materials and its service) before giving money to farmers. Hence, the farmer had very little control over his/her bank loan, cost of farming materials and the money from sale of his/her crops (Felemi, 2001: 13).

But since 2000, the TDB has changed its approach and is now approving loans to farmers based on their individual merits (Felemi, 2001: 13). The main advantage of this system is that it promotes greater efficiency among both farmers and exporting companies. Under this new system, farmers are now able to decide from which company to buy farming materials at a competitive market price. For example, in 1999, Tongatapu Machinery Pool Hire Service started importing and sold NPK and Urea fertilisers at a much lower prices (20 per cent lower) than those offered by exporting companies (Felemi, 2001: 13).

However, small holder farmers are still disadvantaged because they usually do not have collaterals to secure loans. A study by Manu (2000), shows that the small holder farmers are more efficient in squash pumpkin farming *vis-à-vis* large farmers. Hence, one of the challenges of policy makers is how to ensure that small holder farmers are treated fairly and continue to be active partners in the development of squash pumpkin industry.

8.2 Managing the Problem of Under Supply and Over Supply

The reliability and timing of supply of squash pumpkins to Japanese market has to be managed properly to avoid the problems of either under supply or over supply. For example, on one hand in 1998 there was under supply due to the six month drought in Tonga and on the other hand there was over supply in 1994 and 2000 (Felemi, 2001: 7). Under supply implies potential loss of export earnings and over supply contributed to price reduction.

Furthermore, the timing of planting, harvesting and supply to Japanese market has to be right. In the Japanese market, the decline in supply of squash pumpkins begins in December and that is the right time to export to Japan. However, in 2000, the squash pumpkin was exported to Japan in the first week of November and this sent out a signal that there would be a continuous supply and subsequently the price remained low in that year (Felemi, 2001: 8).

8.3 Production Research and Development

The Ministry of Agriculture and Forestry have been conducting research programmes on squash pumpkins and it has been funded by overseas aid. However, the decline of aid money has had a negative impact on the types and scope of research being carried out (Felemi, 2001: 12). Most of the research that are carried out focuses on solving short-term problem and not important long term programmes that would bring significant development in the long run. Continuous research is needed in all areas such as pre-production, production and post harvest.

8.4 High Cost of Farming Material

All squash pumpkin farming materials (seeds, fertilizer and pest control chemicals) have to be imported from overseas. Squash pumpkin seeds are imported from Japan. The cost component of the farming materials is 50% of production cost. Very little work has been done to develop a seed research and development programme to produce seeds locally (Felemi, 2001: 8).

Furthermore, there is lack of efficient information given to farmers by the MAF on which type and quantity of fertilizer to be used in a particular farm.

8.5 Labour Scarcity and High Labour Cost

Labour is scarce and many squash farmers have suffered heavy losses because they were not able to hire the required labour during the various stages of the production process such as preparing the soil, weeding, harvesting and packing. Although, the traditional belief excludes women from agricultural work, Tongan women and children have assisted in the development of the squash pumpkin industry and they are involved in the areas of planting, harvesting, post harvesting, processing and grading for quality (Felemi, 2001: 6).

8.6 Inappropriate Agricultural Machinery and Lack of Training on the Use of the Machinery

The MAF has facilities for farmers to hire agricultural machinery. However, some of the technologies used squash farms are not appropriate and have caused problems for farmers. Furthermore, there is also lack of proper training on how to use the machines on the farms (Felemi, 2001: 12).

8.7 Maintaining Quality

One of the major challenges for Tongan squash pumpkin industry is to establish or be able to maximise its returns on the Japanese market based on 'quality'. Since 1987, the quality of the Tongan squash has improved tremendously and Tonga is the main country exporting squash pumpkin to Japan between December and January period (Felemi, 2001: 15).

8.8 Export and Market Branding of Tongan Squash Pumpkins

Around 50 per cent of the total volume of squash pumpkins exported from Tonga is done through New Zealand exporting companies and hence are classified as New Zealand commodity rather than Tongan produce when they enter the Japanese market (Felemi, 2001: 15). Hence, product branding and marketing are necessary to make Tongan squash pumpkins more visible and to fetch higher prices in the Japanese market. Obviously, the marketing exercise will imply extra costs to the farmers and the exporters, but this could be offset by fetching a much more premium price for its squash in the Japanese market. Furthermore, Tonga also needs to ensure that farmers are producing and supplying only premium quality squash pumpkins as required by the Japanese market.

In addition, nutritional labelling of the squash pumpkins increases awareness and appeals more to Japanese consumers concerning the potential nutritional and caloric contribution to the diet by the consumption of squash pumpkins. The second challenge in export marketing is the capability and ability of the Tongan based exporting companies to negotiate the price with the Japanese importer/distributor counterparts. Since there are too many exporting companies (around 15-200), Japanese importers can play one against the other to keep the price low (Felemi, 2001: 15).

8.9 Regulation of the Industry

During the early period the squash pumpkin industry was heavily regulated by government whereby MAF in an attempt to influence the market allocated a 'quota system' amongst the registered exporting companies. This system created distrust and criticisms by exporters. As a result of this, the exporters began to compete fiercely with each other. They also deliberately undermined each other so as to reduce the number of exporting companies, in order to get a bigger quota (Felemi, 2001: 14).

Furthermore, with the deregulation of the squash pumpkin industry (removal of the quota system) one of the biggest challenges faced is to be able to control production through non-regulatory means, so as not to over-supply the Japanese market. The government now has to depend "largely on the exporters and their willingness to set a range within which production should be targeted and that any decision to exceed the upper limit should be based on sound assessment of the market situation and not by the volume of squash being produced" (Felemi, 2001: 14).

8.10 Lack of Data Given by Exporting Companies

Importing companies keep the real price that they pay to exporting companies confidential hence it is difficult to determine the actual cost of marketing and the profit margins imposed by them. As Felemi (2001: 14) states "this has resulted in important information being withheld by exporting companies which would help guide policies and decisions made by government for the industry".

8.11 Lack of Economies of Scale (Little Cooperation between Exporting Companies)

Exporting companies need to work cooperatively in certain areas rather than competing with each other. For example, rather than individually absorbing the cost of importing farm inputs, they can make bulk purchase arrangements based on the economies of scale which would significantly reduce the cost of inputs. Raw materials such as fertilizers, seeds, equipments, chemicals for pesticides can be jointly purchased. Similarly, exporters can organise themselves and do joint shipping and export marketing which is done individually now.

8.12 Poor Soil Utilisation

There is a tendency amongst some farmers to maximize production output without investing much on the land development. For example, tenant farmers generally do not invest in the long-term development of the land and this practice results in increased soil degradation and poor quality squash pumpkin production. Hence, they have a short-term rather than long-term vision of land development and productivity.

8.13 Opportunities for Value Adding

There is room for value adding from the leftover squash that is not exported. Tonga can experiment with a few value adding activities and they are as follows. First, Tonga can produce 'squash pumpkin seed snacks' similar to that of Hawaiian snacks. Second, the seeds can be used for making pumpkin seed oil. Pumpkin seed oil is thick, green-red oil that is made from roasted pumpkin seeds. Third, Tonga can establish facilities for producing 'frozen chunks of pumpkin' to be exported to overseas markets. Even though these may be innovative ideas pragmatically it may be difficult to embark on these facilities because such processing plants would require processing facilities, finance, infrastructure development, technology and technical expertise which may not be feasible in the short to medium term.

8.14 Recommendations

During the period 2005-2006 there was a major decline in the total export earnings from the squash pumpkin industry. In order to rejuvenate the industry, the policy makers should consider and implement the following recommendations:

1. The government should make sure that there is sufficient supply of squash pumpkins to the Japanese market. It should avoid the situation of oversupply and undersupply. Since the government has uplifted the quota system the biggest challenge for the government is to control production through non tariff means. This will depend on exporting company's willingness to give accurate information to the government.

2. The Tongan government should use its diplomatic ties to negotiate a better price for the squash pumpkin exports to Japan. The Tongan government officials need to negotiate with Japanese and Korean Trade Ministers for better deal for exported of squash pumpkins. Over the past years, there has been a decline in squash export price.

3. The government should educate the farmers about proper farm management practices so as to avoid pest and disease especially on large scale farms which tend to maximize production by planting seeds close to each other. The smaller farms are more efficient than the large ones.

4. Assist small holder farmers to have access to loan and working capital via Tongan Development Bank (TDB). It could be beneficial for the government to promote small holder farmers.

5. Continuous research and training is needed to ensure that the quality of squash pumpkin improves and to avoid pests and diseases.

9. Conclusion

To sum up, this paper has examined the economic contribution made by the export of squash pumpkins, the various stakeholders in the squash industry, the main features of the Tongan squash pumpkin supply chain, the constraints, challenges, and prospects for future sustainability and growth of the squash pumpkin industry in Tonga. Over the last twenty three years, the Tongan government has put an effort in developing the squash pumpkin industry by upgrading infrastructural facilities (including packing houses) and providing agricultural machineries and credit facilities. However, more work is needed especially in the area of research and development of appropriate production and post harvest technologies. Without external donor funding such programmes it would be costly but can be solved by introducing ‘user pay’ policy.

The government intervention should be less unlike previously and play a facilitative role in ensuring the equitable distribution of opportunities and benefits to all the stakeholders and not just a few. The deliberations and suggestions from stakeholders have fed into policy making. Hence, policy making in the squash industry is very much participatory in nature.

Finally, policy makers must re-think and try to broaden the export base of the economy in case the squash industry collapses. Lessons can be learnt from the collapse of the banana and coconut industries in 1980s which had major impact on the Tongan economy and luckily it was saved by the squash export. Similarly, Tonga needs to diversify into other exportable commodities in case the squash industry collapses. In order to do this, Tonga needs to do research into potential new export commodities. The reliance of major export earnings into a single commodity and to a single market leaves the economy vulnerable to external shocks. The situation of oversupply in 1994 and in 2000 further exposes the fact that a niche market has a limited volume and lifespan.

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